This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims:

1. **(original)** A method of forming a pattern of a functional material on a substrate comprising:

applying a first pattern of a first material to said substrate; and applying a second functional material to said substrate and said first material, wherein said first material, said second functional material, and said substrate interact to spontaneously form a second pattern of said second functional material on said substrate, to thereby form a pattern of a functional material a substrate.

2. **(original)** The method of claim 1, further comprising applying an additional pattern of an additional material to said substrate, to thereby form a multi-layered pattern of materials on said substrate.

3. **(original)** The method of claim 2, wherein said additional material is the same as said first material.

4. **(original)** The method of claim 2, wherein said additional material is the same as said second material.

5. **(original)** The method of claim 2, wherein said additional material is different from said first and second materials.

6. **(original)** The method of claim 2, wherein said additional pattern is different from said first pattern.

7. **(original)** The method of claim 2, wherein said additional pattern is different from said second pattern.

8. **(original)** The method of claim 3, wherein said additional pattern is orthogonal to said first pattern.

9. **(original)** The method of claim 8, wherein said additional pattern is a chessboard pattern.

10. **(original)** The method of claim 5, wherein said additional pattern of additional material

overlays said first and second patterns, thereby creating a multi-layer composite material.

11. **(original)** The method of claim 10, wherein said first and second materials are electrically conducting materials, thereby creating electrically conducting junctions.

12. **(original)** The method of claim 1, wherein said second material is applied substantially uniformly to said substrate containing said first pattern.

13. **(original)** The method of claim 1, wherein said second material comprises an information carrying material such that said second pattern possesses engineered functionality.

14. **(original)** The method of claim 1, wherein said interaction among said first material, said second material, and said substrate is selected from the group of interactions consisting of hydrophobic/hydrophilic, solvent wettablility, ionic forces, ion-dipole forces, hydrogen bonds, charge transfer forces, Van der Waals forces, chemical (covalent) bonds, general mechanical adhesion, penetration, and magnetic interactions.

15. **(original)** The method of claim 14, wherein said interaction among said first material, said second material, and said substrate is hydrophobic/hydrophilic.

16. **(original)** The method of claim 1, further comprising removing said first pattern of the first material from said substrate.

17. **(original)** The method of claim 1, wherein said first pattern of the first material is applied by a method selected from the group consisting of non-contact printing, photolithographic printing, offset printing, silk-screen printing, stamping, etching, hand-drawing, and any combination thereof.

18. **(original)** The method of claim 17, wherein said first pattern of the first material is applied by non-contact printing.

19. **(original)** The method of claim 18, wherein said non-contact printing comprises electrophotographic printing.

20. **(original)** The method of claim 18, wherein said first pattern of the first material is applied by laser printing.

21. **(original)** The method of claim 18, wherein said first pattern of the first material is applied by xerographic printing.

22. **(original)** The method of claim 18, wherein said first pattern of the first material is applied by solid ink printing.

23. **(original)** The method of claims 20 or 21, wherein said first material comprises a toner ink.

24. **(original)** The method of claim 18, wherein said first pattern of the first material has a line resolution of at least about 10 μm.

25. **(original)** The method of claim 1, wherein said second pattern is the same as said first pattern.

26. **(original)** The method of claim 1, wherein said second pattern is the inverse of said first pattern.

27. **(original)** The method of claim 1, wherein said substrate is selected from the group consisting of glass, metal, plastic, wood, fabric, paper, quartz, crystal, stone, and ceramic.

28. **(original)** A method of forming a pattern of a functional material on a substrate comprising:

non-contact printing a first pattern of a first material on said substrate; and

applying a second functional material to said substrate and said first material,

wherein said first material, said second material, and said substrate interact to spontaneously form a second pattern of said second functional material on said substrate, to thereby form a pattern of a functional material on a substrate.

29. **(original)** The method of claim 28, wherein said interactions between said first material, said second material, and said substrate are hydrophobic/hydrophilic such that said first material, said second material, and said substrate interact to spontaneously form a second pattern of said second material on said substrate.

30. **(original)** The method of claim 28, further comprising removing said first pattern of the first material from said substrate.

31. **(original)** The method of claim 28, wherein said non-contact printing comprises electrophotographic printing.

32. **(original)** The method of claim 28, wherein said first pattern of the first material is applied by laser printing.

33. **(original)** The method of claim 28, wherein said first pattern of the first material is applied by xerographic printing.

34. **(original)** The method of claim 28, wherein said first pattern of the first material is applied by solid ink printing.

35. **(original)** The method of claims 32 or 33, wherein said first material comprises a toner ink.

36. **(original)** The method of claim 28, wherein said first pattern of the first material has a line resolution of at least about 10 μm.

37. **(original)** The method of claim 28, wherein said second pattern is the inverse of said first pattern.

38. **(original)** The method of claim 28, wherein said substrate is flexible.

39. **(original)** The method of claim 28, wherein said flexible substrate is selected from the group consisting of paper, plastic, and fabric substrates.

40. **(original)** The method of claim 28, wherein said second material comprises an electrically active material.

41. **(original)** The method of claim 40, wherein said second material comprises an electrically conductive polymer.

42. **(original)** The method of claim 41, wherein said second material comprises an aqueous mixture of an electrically conductive polymer.

43. **(original)** The method of claim 28, wherein said first material has an electrical conductance that is lower than that of said second material.

44. **(original)** The method of claim 28, wherein said first material is electrically nonconductive ink.

45. **(original)** The method of claim 28, wherein said substrate has an electrical conductance that is lower than that of said second material.

46. **(original)** The method of claim 28, wherein said second material is electrically non-conductive.

47. **(original)** A method of forming a pattern of a functional material on a substrate comprising:

non-contact printing a first pattern of a first material on said substrate; and

applying a second functional material to said substrate and said first material, wherein said first and second functional materials are selected to have a sufficient difference in at least one property of hydrophobicity and hydrophilicity relative to one another such that said first material, said second functional material, and said substrate interact to spontaneously form a second pattern of said second functional material on said substrate, to thereby form on said substrate a second pattern of said second functional material, wherein said second pattern is the inverse of said first pattern, to thereby form a pattern of a functional material to a substrate.

48. **(original)** The method of claim 47, further comprising removing said first pattern of the first material from said substrate.

49. **(original)** The method of claim 47, wherein said non-contact printing comprises electrophotographic printing.

50. **(original)** The method of claim 47, wherein said non-contact printing comprises laser printing.

51. **(original)** The method of claim 47, wherein said non-contact printing comprises xerographic printing.

52. **(original)** The method of claim 47, wherein said first pattern of the first material is applied by solid ink printing.

53. **(original)** The method of claim 47, wherein said substrate is flexible.

54. **(original)** The method of claims 50 or 51, wherein said first material comprises a toner ink.

55. **(original)** The method of claim 54, wherein said second material comprises an aqueous solution of an electrically conductive polymer.

56. **(original)** The method of claim 55, wherein said substrate and said toner ink are electrically non-conducting relative to said electrically conductive polymer.

57. **(original)** A method of forming an electrical circuit element, comprising: applying a first pattern of a first material on a substrate; and

applying a second material to said substrate and said first material, wherein said first material, said second material, and said substrate interact to spontaneously form a second pattern of said second material on said substrate, thereby forming an electrical circuit element.

58. **(original)** The method of claim 57, wherein said first pattern of the first material is applied by non-contact printing.

59. **(original)** The method of claim 57, wherein said non-contact printing comprises electrophotographic printing.

60. **(original)** The method of claim 58, wherein said non-contact printing comprises laser printing.

61. **(original)** The method of claim 58, wherein said non-contact printing comprises xerographic printing.

62. **(original)** The method of claim 58, wherein said solid ink printing.

63. **(original)** The method of claims 60 or 61, wherein said first material comprises a toner ink.

64. **(original)** The method of claim 58, wherein said first pattern of the first material has a line resolution of at least about 10 μm.

65. **(original)** The method of claim 57, wherein said second pattern is the inverse of said first

pattern.

66. **(original)** The method of claim 57, wherein said substrate is selected from the group consisting of glass, metal, plastic, wood, fabric, paper, quartz, crystal, stone, and ceramic.

67. **(original)** The method of claim 57, wherein said first and second materials are selected to have a sufficient difference in at least one property of hydrophobicity and hydrophilicity relative to one another such that said first material, said second material, and said substrate interact to spontaneously form a second pattern of said second material on said substrate.

68. **(original)** The method of claim 57, further comprising removing said first pattern of said first material.

69. **(original)** The method of claim 67, wherein said substrate is a flexible substrate.

70. **(original)** The method of claim 67, wherein said substrate is a flexible plastic substrate.

71. **(original)** The method of claim 70, wherein said first material is electrically non-conductive.

72. **(original)** The method of claim 71, wherein said first material is a toner ink.

73. **(original)** The method of claim 67, wherein said first material is a polyimide.

74. **(original)** The method of claim 72, wherein said second material is an electrically active material.

75. **(original)** The method of claim 74, wherein said electrically active material is an electrically conductive material that is selected from the group consisting of polymeric material, a metallic dispersion, a metallic solution, a sol gel of indium tin oxide, a non-polymeric material, and a derivative thereof.

76. **(original)** The method of claim 75, wherein said polymeric material is selected from the group consisting of a polypyrrole, a polythiophene, a polyaniline, a poly-phenylenevinylene, and a polyacetylene, and a derivative thereof.

77. **(original)** The method of claim 76, wherein said polymer comprises poly-3,4-ethylenedioxythiophene-polystyrene sulfonate (PEDOT-PSS).

78. **(original)** The method of claim 74, wherein said electrically conductive material comprises a non-polymer selected from the group consisting of a phthalocyanine, a porphyrin, an anthracene, a fullerene, a triphenylamine, a stilbene, and a derivative thereof.

79. **(original)** The method of claim 57, wherein said second material is applied substantially uniformly to said substrate containing said first pattern.

80. **(original)** The method of claim 79, wherein said second material is applied by rolling the second material onto the substrate, spraying the second material onto the substrate, melting the second material onto the substrate, dipping the substrate into the second material, or exposing the substrate to gasses or vapors of the second material.

81. **(original)** The method of claim 79, further comprising applying a third material by rolling the third material onto the substrate, spraying the third material onto the substrate, melting the third material onto the substrate, dipping the substrate into the third material, or exposing the substrate to gasses or vapors of the third material, wherein the combination of the second and third material produces a functionally active fourth material.

82. **(original)** The method of claim 68, wherein said first material is removed by ultrasonic treatment with a solvent, cleaning with a solvent, cleaning by mechanical action, adhesive modification through chemical alteration, evaporation or melting.

83. **(original)** The method of claim 57, wherein said circuit element is selected from the group consisting of an inductor, a resistor, a capacitor, an Inductor-Capacitor (LC) resonator, a switch, a filter, a transistor, a Schottky junction, a p-n junction, and a sensor.

84. **(original)** The method of claim 57, wherein said circuit element is an inductor.

85. **(original)** The method of claim 57, wherein said circuit element is a resistor.

86. **(original)** The method of claim 57, wherein said circuit element is a capacitor.

87. **(original)** The method of claim 57, wherein said circuit element is an Inductor-Capacitor (LC) resonator.

88. **(original)** The method of claim 57, wherein said circuit element is a switch.

89. **(original)** The method of claim 57, wherein said circuit element is a filter.

90. **(original)** The method of claim 57, wherein said circuit element is a transistor.

91. **(original)** The method of claim 57, wherein said circuit element is a Schottky junction.

92. **(original)** The method of claim 57, wherein said circuit element is a p-n junction.

93. **(original)** The method of claim 57, wherein said circuit element is a sensor.

94. **(original)** The method of claim 57, wherein said circuit element is an electric stress sensor.

95. **(original)** The method of claim 83, wherein said circuit element comprises an inductor and said second pattern comprises at least one of a serpentine pattern and a spiral pattern.

96. **(original)** The method of claim 83, wherein said circuit element comprises a resistor defined by the length, width, and height of said second pattern and the conductivity of said second material.

97. **(original)** The method of claim 83, wherein said circuit element comprises a capacitor, wherein the first material is a dielectric and the second material is an electrically conductive material that further comprises an interdigitated pattern of said first and said second materials on said substrate to thereby form a pattern of said electrically conductive second material on said substrate separated by a dielectric.

98. **(original)** The method of claim 97, further comprising removing said first pattern of first material from said substrate, thereby providing a capacitor comprised of a pattern of said electrically conductive second material on said substrate, wherein air is said dielectric.

99. **(original)** The method of claim 83, wherein said circuit element comprises a capacitor, wherein said pattern of said first material is applied to both sides of said substrate and said second material is

applied to said patterns of said first material on said substrate, wherein said second pattern forms on both sides of said substrate, such that said second material is electrically conductive and said second patterns overlap, at least in part, to thereby form two patterns of said electrically conductive second material on said substrate separated by said dielectric substrate.

100. **(original)** The method of claim 83, wherein said circuit element further comprises a second circuit element, wherein said second circuit element is formed by: non-contact printing a third pattern of a third material on a second substrate; and applying a fourth material to said second substrate and said third material; wherein said third material, said fourth material, and said substrate interact to spontaneously form a second pattern of said fourth material on said substrate, wherein the second material and fourth material on said first and said second substrates comprise an electrically conductive material, and said pattern of said first substrate and said pattern of said second substrate are opposed to each other so as to form a switch in which the electrically conductive material on each substrate is separated by the respective heights on the substrates of the first material and the third material until at least one of the substrates is depressed so as to put the electrically conductive materials into electrical contact with each other.

101. **(original)** The method of claim 100, wherein said first and third materials are the same.

102. **(original)** The method of claim 83, wherein said filter is a Resistor-Capacitor (RC) filter.

103. **(original)** The method of claim 90, wherein said filter comprises a first pattern of electrically conductive material connected to electrical ground and a second pattern of electrically conductive material connected to an input signal at one end of said second pattern and to an output at another end of said second pattern, said circuit further comprising at least one capacitor electrically connected between said first and second patterns to form an RC filter.

104. **(original)** The method of claim 83, wherein said transistor is a field effect transistor-like device.

105. **(original)** The method of claim 104, wherein said electrically conductive material comprises a semi-conducting polymer material deposited on said substrate as at least one of a source, a drain, and a connection between said source and drain.

106. **(original)** The method of claim 105, further comprising applying said semi-conducting polymer material as a control layer forming a gate disposed over said electrically conductive

polymer material connecting said source and said drain and separated therefrom by an insulator.

107. **(original)** The method of claim 105, wherein said semi-conducting polymer material is selected from the group consisting of a phthalocyanine, a porphyrin, an anthracene, a fullerene, a triphenylamine, a stilbene, and a derivative thereof.

108. **(original)** The method of claim 72, further comprising removing said first pattern of toner ink by ultrasound treatment with an organic solvent.

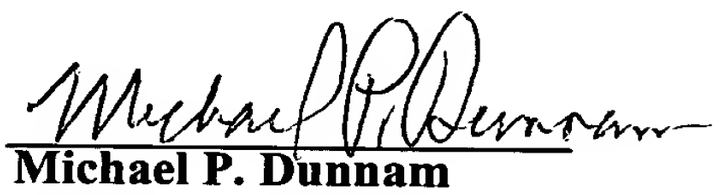
109-157. **(canceled)**

CONCLUSION

Applicants have elected the Group I claims (claims 1-108) without traverse. Applicants submit that this paper fully responds to the May 12, 2003, restriction requirement, and thus request an early and favorable action on the merits.

Respectfully submitted,

Date: August 12, 2003



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